

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application No: 10/540,606  
Applicants: Toshiaki Takenaka et al.  
Filed: June 27, 2005  
Title: METHOD AND APPARATUS FOR  
MANUFACTURING CIRCUIT BOARD  
T.C./A.U.: 1792  
Examiner: Brian K. Talbot  
Confirmation No.: 9266  
Docket No.: MAT-8716US

**APPEAL BRIEF**

**MAIL STOP APPEAL BRIEF - PATENTS**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Further to the Notice Of Appeal dated **September 15, 2009**, and the Notice of Panel Decision from Pre-Appeal Brief Review dated **October 21, 2009**, Appellant is submitting this Appeal Brief for the above-identified application.

**I. REAL PARTY IN INTEREST**

The real party in interest is Panasonic Corporation.

**II. RELATED APPEALS AND INTERFERENCES**

There are no appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**III. STATUS OF CLAIMS**

Claims 1-5, 8-16, 23-25 and 27-35 are pending in the above-referenced application. Claims 6, 7, 17-22 and 26 have been cancelled. Claims 1-5, 8-16, 23-25 and 27-35 have been appealed.

#### **IV. STATUS OF AMENDMENTS**

The present application is under Non-Final Rejection. All previously filed Amendments have been entered.

#### **V. SUMMARY OF CLAIMED SUBJECT MATTER**

The present invention relates to a method and apparatus for manufacturing circuit board used in various electronic devices. The conventional method for manufacturing double-sided circuit board is shown in FIGS. 10A through 15. With respect to Appellants' claim 1, the method for manufacturing a circuit board comprises attaching a mask film 2a to a substrate 1 in at least one squeegee area, the mask film including a first surface opposite a surface attached to the substrate as shown in FIGS. 1A through 5. The method includes forming a plurality of depressions 6 in the first surface 2a in the at least one squeegee area, each depression surrounded by a respective periphery having an elevation higher than an elevation of the first surface 2a as shown in FIGS. 3 and 5. The method further includes forming a through-hole 3 through the mask film and the substrate in the at least one squeegee area; filling conductive paste 4 into the through-hole 3 by using a squeezing operation in the at least one squeegee area as shown in FIGS. 1D and 5. Finally, the method includes cleaning a squeegee using the formed plurality of depressions during the squeezing operation as shown in FIG. 5. Support for the method that is disclosed in claim 1 may be found on page 10, lines 7-24 of the specification, as well as page 11, line 13 through page 14, line 11.

Similarly, with respect to Appellants' claim 2, the method for manufacturing a circuit board including attaching a mask film 2a to a substrate 1 in at least one squeegee area, the mask film 2a including a first surface opposite a surface attached to the substrate as shown in FIGS. 1A through 5. The method includes forming a squeegee cleaning part at the first surface in the at least one squeegee area, the squeegee cleaning part having a plurality of depressions 6 in the first surface, each depression surrounded by a respective periphery having an elevation higher than an elevation of the first surface as shown in FIGS. 3 and 5. The method additionally includes forming a through-hole 3 through the substrate 1 and the mask film 2a in the

at least one squeegee area and then filling conductive paste 4 into the through-hole 3 by using a squeezing operation in the at least one squeegee area. Finally, the method includes cleaning a squeegee using the squeegee cleaning during the squeezing operation, wherein the squeegee cleaning part is formed at a predetermined position in the mask film before the filling of the conductive paste 4. Support for the method that is disclosed in claim 2 may be found on page 10, lines 7-24 of the specification, as well as page 11, line 13 through page 14, line 11.

With respect to claim 25, it is disclosed that the squeegee cleaning part is a plurality of the linear grooves. Support for this claim is located in the specification on page 11 at lines 18-20: "[s]queegee cleaning part 6 is formed of hound's-tooth through-holes by using a laser, however no-penetrated-holes or a linear groove may be used."

#### **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

Claims 1-5, 7-16, 23, 24 and 26-35 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Japanese Patent No. 2001-213064 (hereinafter "Takenaka") in combination with Japanese Patent No. 57-103862 (hereinafter "Kuroki"). Claims 6 and 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Takenaka in combination with Kuroki further in combination with Japanese Patent No. 2001-7514 (hereinafter "Kozo").

#### **VII. ARGUMENT**

##### **A. REJECTION OF CLAIMS 1-5, 7-16, 23, 24 AND 26-35**

Claims 1-5, 7-16, 23, 24 and 26-35 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Takenaka in combination with Kuroki. This rejection is respectfully traversed.

Independent claim 1 discloses

... forming a plurality of depressions in the first surface in the at least one squeegee area, each depression surrounded by a respective periphery having an elevation higher than an elevation of the first surface ...

This is illustrated by Applicants' Fig. 3 in which cleaning part 6 is surrounded, for example, by swollen portion 7. The advantage of Applicants' claimed feature is described in the originally filed application at page 10, line 16 et seq. where it is stated:

Using the method discussed above, high viscous paste of a squeegee edge part is removed at the cleaning part before past is filled in through-holes in a product. Therefore, solid past is not remained at the through-holes in the product. Thus, when the mask films are peeled, possibility that a part of the past is removed to a side of the mask films and quality of connection is adversely affected can be reduced.

To establish a *prima facie* case of obviousness, a combination of references must disclose, teach, or suggest every feature of the claims. As discussed during the telephone interview of May 11, 2009, Kuroki discloses depressions and elevated portions. Kuroki, however, lacks Applicants' claimed feature described above.

The prior art of record lacks Applicants' claimed "depression surrounded by a respective periphery having an elevation higher than an elevation of the first surface." Kuroki illustrates elevated portions 8' and the depressed regions 5. This is different than Applicants' claimed invention in which each depression is surrounded by a periphery with higher elevation. Accordingly, claim 1 is patentable over the art of record.

In the outstanding Official Action, the previous rejection has been maintained. Takenaka is combined with Kuroki. The argument in the Official Action is as follows:

Therefore it would have been obvious for one skilled in the art at the time the invention was made to have modified Takenaka et al. (JP2001-213,064) process by including "elevations" along with the depressions as evidenced by Kuroki et al. (JP 57-103862) with the expectation of achieving a more complete removal of the excess past from the squeegee. (Official Action, page 3, bottom, through page 4, line 2).

The Official Action has ignored important limitations that appear in claim 1, lines 6 and 7. Those limitations are:

- 1) "each"
- 2) "surrounded"
- 3) "respective"

The above three limitations are completely missing from the arguments set forth in the Official Action. Furthermore, Appellants note the following language which appears in their application at page 11, line 23 through line 26.

It is acceptable that surroundings of processed part at mask film 2a have swollen portions 7. A height of swollen portion 7 is preferably set not lower than 3 $\mu$ m. If it lower than 3 $\mu$ m, an effect of removing paste bonded to an edge of a squeegee deteriorates.

Kuroki does not have elevated portions around each depression. According to Appellants' application, elevations "lower than 3 $\mu$ m" (i.e. no elevations) will not be effective in removing paste. Kuroki further fails to teach or suggest the above feature, nor would the above feature have been obvious in light of Takenaka in combination with Kuroki to one of ordinary skill in the art.

Independent claim 2, while not identical to claim 1, is also patentable over the art of record for reasons similar to those set forth above with regard to claim 1.

Therefore, independent claims 1 and 2 are not obvious over Takenaka in combination with Kuroki. Claims 3-5, 7-16, 23, 24 and 26-35 are patentable by virtue of their dependency on allowable independent claims 1 or 2.

#### **B. REJECTION OF CLAIM 25**

Claim 25 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Takenaka in combination with Kuroki further in combination with Kozo. This rejection is respectfully traversed.

Claim 25 ultimately depends from independent claim 2. To establish a *prima facie* case of obviousness, a combination of references must disclose, teach, or suggest every feature of the claims. As previously argued, independent claim 2, is not

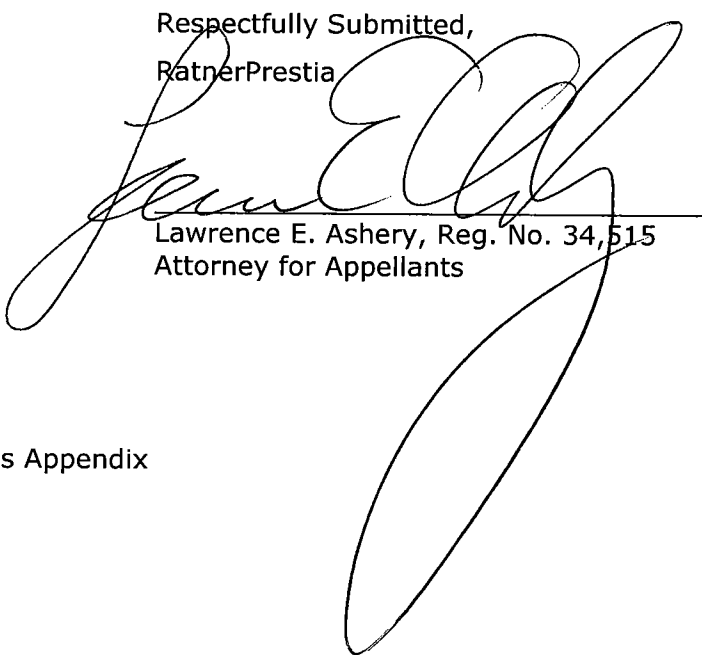
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obvious over the cited prior art. Claim 25 is patentable by virtue of its dependency on allowable independent claim 2.

In view of the arguments set forth above, reversal of the rejection of the claims of the above-identified application is respectfully requested.

Respectfully Submitted,  
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Enclosures: Claims Appendix  
Evidence Appendix  
Related Proceedings Appendix

Dated: November 23, 2009

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**CLAIMS APPENDIX**

1. A method for manufacturing a circuit board comprising:

attaching a mask film to a substrate in at least one squeegee area, the mask film including a first surface opposite a surface attached to the substrate;

forming a plurality of depressions in the first surface in the at least one squeegee area, each depression surrounded by a respective periphery having an elevation higher than an elevation of the first surface;

forming a through-hole through the mask film and the substrate in the at least one squeegee area; filling conductive paste into the through-hole by using a squeezing operation in the at least one squeegee area; and

cleaning a squeegee using the formed plurality of depressions during the squeezing operation.

2. A method for manufacturing a circuit board comprising:

attaching a mask film to a substrate in at least one squeegee area, the mask film including a first surface opposite a surface attached to the substrate;

forming a squeegee cleaning part at the first surface in the at least one squeegee area, the squeegee cleaning part having a plurality of depressions in the first surface, each depression surrounded by a respective periphery having an elevation higher than an elevation of the first surface;

forming a through-hole through the substrate and the mask film in the at least one squeegee area;

filling conductive paste into the through-hole by using a squeezing operation in the at least one squeegee area; and

cleaning a squeegee using the squeegee cleaning part during the squeezing operation,

wherein the squeegee cleaning part is formed at a predetermined position in the mask film before the filling of the conductive paste.

3. The method for manufacturing a circuit board of claim 1,

wherein the plurality of depressions are formed at a position which is not used to form a portion of the circuit board or an area outside of a product area of a paste-filling area of the mask film and within a printing range.

4. The method for manufacturing a circuit board of claim 1,

wherein each depression is a through-hole formed in the mask film.

5. The method for manufacturing a circuit board of claim 1,

wherein each depression is a linear groove formed at a paste-filling area of the mask film, the linear groove being formed so as not to penetrate through the substrate.

6. - 7. (Cancelled)

8. The method for manufacturing a circuit board of claim 5,

wherein the forming of each linear groove of the mask film includes processing the linear groove using a cutting edge.

9. The method for manufacturing a circuit board of claim 8,

wherein the cutting edge is a round blade.

10. The method for manufacturing a circuit board of claim 9,

wherein the round blade is fixed to a blade-fixing section having vertically sliding function with a certain load so as not to rotate.

11. The method for manufacturing a circuit board of claim 10, further comprising setting a depth of the linear groove and the elevation of the perimeter



portion of the plurality of depressions by adjusting an edge angle of the round blade and a load.

12. The method for manufacturing a circuit board of claim 1,

wherein the elevation of the perimeter portion of each depression is above the first surface by 3 $\mu$ m or more.

13. The method for manufacturing a circuit board of claim 1,

wherein the substrate is a prepreg where resin material, whose main body is thermosetting resin, is impregnated into a fabric or a nonwoven fabric, thereby forming B-stage.

14. The method for manufacturing a circuit board of claim 13,

wherein aramid fabric is the main body of the fabric or the nonwoven fabric.

15. The method for manufacturing a circuit board of claim 13,

wherein glass fiber is the main body of the fabric or the nonwoven fabric.

16. The method for manufacturing a circuit board of claim 1, wherein:

the filling of the conductive paste into the through-hole by using the squeezing operation comprises:

filling the conductive paste into the through-hole by reciprocating the squeegee on the circuit board; and

the cleaning of the squeegee using the formed plurality of depressions during the squeezing operation includes cleaning an edge of the squeegee by using the plurality of depressions.

17. - 22. (Cancelled)

23. The method for manufacturing a circuit board of claim 2,

wherein the predetermined position is a position which is not used to form a portion of the circuit board or an area outside of a product area of a paste-filling area of the mask film and within a printing range.

24. The method for manufacturing a circuit board of claim 2,

wherein the squeegee cleaning part is a linear groove formed at a paste-filling area of the mask film, the linear groove being formed so as not to penetrate through the substrate.

25. The method for manufacturing a circuit board of claim 24,

wherein the squeegee cleaning part is a plurality of the linear grooves.

26. (Cancelled)

27. The method for manufacturing a circuit board of claim 24,

wherein the forming of the linear groove of the mask film includes processing the linear groove using a cutting edge.

28. The method for manufacturing a circuit board of claim 27,

wherein the cutting edge is a round blade.

29. The method for manufacturing a circuit board of claim 28,

wherein the round blade is fixed to a blade-fixing section having vertically sliding function with a certain load so as not to rotate.

30. The method for manufacturing a circuit board of claim 29, further comprising setting a depth of the linear groove and the elevation of the perimeter portion of the squeegee cleaning part by adjusting an edge angle of the round blade and the load.

31. The method for manufacturing a circuit board of claim 2,

wherein the elevation of the perimeter portion is above the first surface by 3 $\mu$ m or more.

32. The method for manufacturing a circuit board of claim 2,

wherein the substrate is a prepreg where resin material, whose main body is thermosetting resin, is impregnated into a fabric or a nonwoven fabric, thereby forming B-stage.

33. The method for manufacturing a circuit board of claim 32,

wherein aramid fabric is the main body of the fabric or the nonwoven fabric.

34. The method for manufacturing a circuit board of claim 32,

wherein glass fiber is the main body of the fabric or the nonwoven fabric.

35. The method for manufacturing a circuit board of claim 2,

wherein the filling of the conductive paste into the through-hole by using the squeezing operation comprises:

filling the conductive paste into the through-hole by reciprocating the squeegee on the circuit board; and

the cleaning of the squeegee includes cleaning an edge of the squeegee by using the squeegee cleaning part.

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**EVIDENCE APPENDIX**

None.

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**RELATED PROCEEDINGS APPENDIX**

None.